MULTIMEDIA UNIVERSITY*

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2015/2016

HCB1011 – CELL BIOLOGY

17 OCTOBER 2015
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This paper consists of **10** pages (including the front page) with **2** Parts (**A** and **B**).
2. **Part A** consists of **10** Multiple Choice Questions (MCQ). All questions carry equal marks (1 mark per question). Answer **ALL** questions in the **OMR** provided on page **3** of this paper.
3. **Part B** consists of **5** Short Answer Type questions. All questions carry equal marks (10 marks per question). Answer **FOUR (4) QUESTIONS ONLY.** Print your answers **clearly** and **neatly** in the boxes provided.

PART A: Multiple Choice Questions

Question 1 to 10 [10 marks]

1. What are chromosomes composed of?
   A. tRNA and DNA
   B. tRNA and lipids
   C. DNA and proteins
   D. RNA and ribosomes

2. How do the inner membrane of the mitochondria and the nuclear envelope differ?
   A. The nuclear envelope has pores and the mitochondrial membrane does not.
   B. The mitochondrial membrane is not permeable and the nuclear envelope is.
   C. The mitochondrial membrane has many folds and the nuclear envelope does not.
   D. The nuclear envelope has two phospholipid layers and the mitochondrial membrane does not.

3. Which of the following is NOT membrane bounded?
   A. mitochondrion
   B. lysosome
   C. ribosome
   D. endoplasmic reticulum

4. What structure is common to ALL cells?
   A. chloroplast
   B. cell membrane
   C. cell wall
   D. mitochondria

5. During the final stage of cell division, the mitotic apparatus disappears, the chromosomes become attenuated, the centrioles duplicate and split, the nuclear membrane becomes reconstituted and the nucleolus reappears. This phase of cell division is known as:
   A. prophase
   B. metaphase
   C. anaphase
   D. telophase

6. The chromosomes of a eukaryotic cell are located in the:
   A. mitochondria
   B. nucleus
   C. ribosome
   D. endoplasma

7. Storage compartment in a cell
   A. lysosome
   B. vacuole
   C. endoplasmic reticulum
   D. mitochodion

Continued...

8. Site of protein synthesis
A. lysosome
B. centriole
C. ribosome
D. endoplasmic reticulum

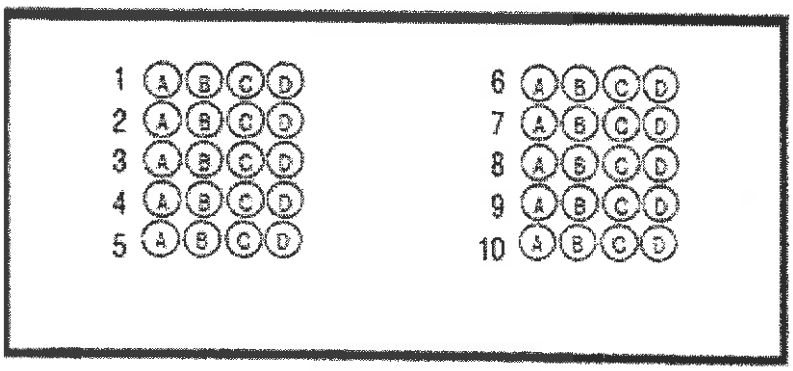
9. Which of the following events are found in BOTH transcription and translation?
i. Elongation
ii. Initiation
iii. Peptide bond synthesis
iv. Splicing
v. Termination
A. I and IV
B. I, III, and V
C. I, II and V
D. I, II, and III

10. Which of the following is NOT considered a second messenger?
A. cAMP
B. Adenylyl cyclase
C. calcium ions
D. inositol triphosphate

MULTIPLE CHOICE QUESTION ANSWER SHEET

TABLE NO: _____ STUDENT ID: _____

SUBJECT: _____ SUBJECT CODE: _____

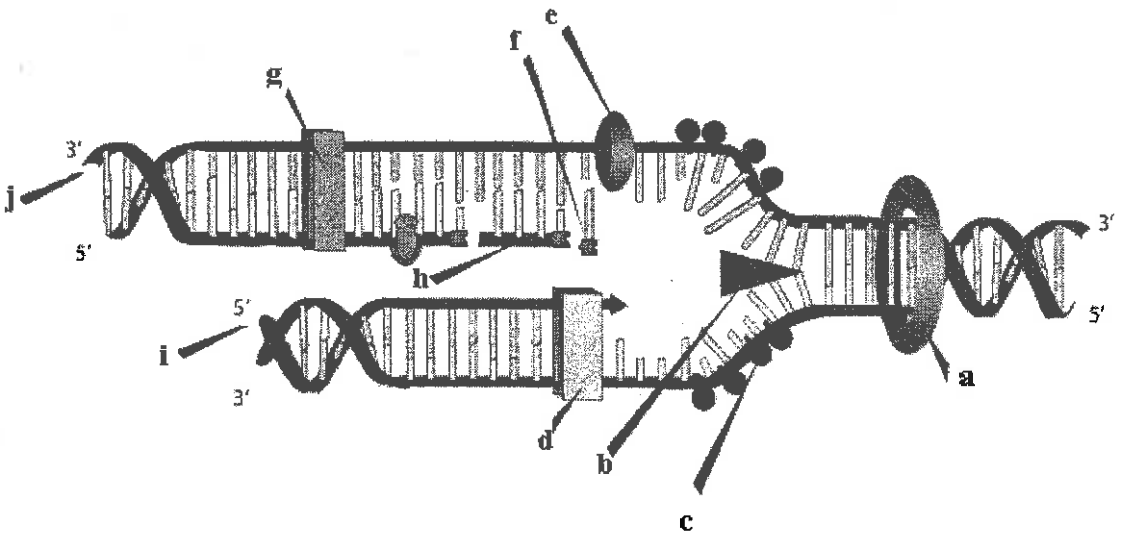


Continued...

PART B: Short Answer Type Questions

Question 1

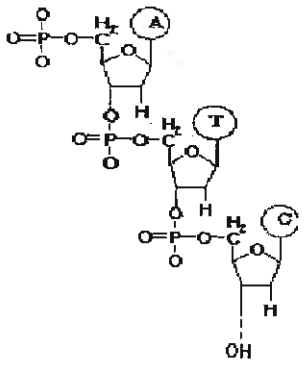
a) Match each of the following: **[5 marks]**



The lagging strand.	
The leading strand	
These prevent the DNA from recoiling after the action of the helicase	
This molecule removes the supercoiling ahead of the replication fork	
This molecule forms short RNA primers that start replication	
Unwraps the double-helix ahead of the replication fork	
The protein that is synthesizing the new daughter strand from the leading strand	
DNA fragments that allow replication of the lagging strand	
The RNA primers formed by the primase enzyme	
This molecule is using the Okazaki fragments to replicate the lagging strand	

Continued...

b) A segment of DNA is shown below. What is the polarity of this DNA? (show 5' and 3'ends)
[1 mark]



c) What is Chargaff's rule?
[2 marks]

d) Cells were obtained from a patient with a viral infection. The DNA extracted from these cells consisted of two forms: **double-stranded human DNA and single-stranded viral DNA.** The base compositions of these two forms of DNA were as follows:

	A	C	G	T
DNA 1	22.1%	27.9%	27.9%	22.1%
DNA 2	31.3%	31.3%	18.7%	18.7%

Which form was the viral DNA, and which form was the human DNA? Explain your reasoning.
[2 marks]

Continued...

Question 2

a) Circle the term that does not belong in each of the following groups, and briefly explain why it does not belong. **[5 marks]**

i. G1 phase, G2 phase, S phase, Telophase:

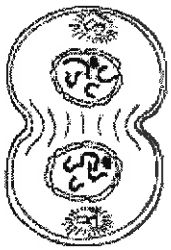
ii. Anaphase, interphase, metaphase, prophase:

iii. Binary fission, mitosis, meiosis, cytokinesis:

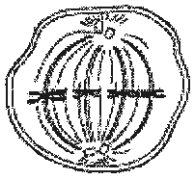
iv. Cleavage furrow, cytokinesis, spindle fiber, cell plate:

v. Centrioles, vesicles, kinetochore fibers, polar fibers:

b) In the spaces provided below, label each figure with the phase of mitosis that it represents. **[2 marks]**

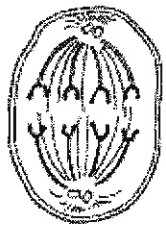


i. _____



ii. _____

iii. _____



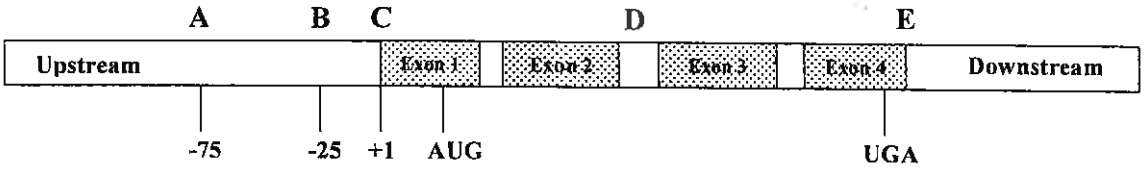
iv. _____

c) What would happen to a cell and its offspring if the cell did not go through a G1 phase during its cell cycle? Explain. **[3 marks]**

Continued...

Question 3

a) This diagram represents regions around a gene encoding a mRNA. Exon I of the mRNA contains the translation initiation AUG codon. Exon IV contains the UGA termination codon. The letters A through E above the diagram refer to areas of the gene and its transcript located directly below them. **[4 marks]**



i. What region of the primary transcript is removed by a spliceosome?	
ii. What region of the DNA contains the TATA box?	
iii. Where is the poly (A) tail added to the transcript?	
iv. Where is the 5' cap added to the transcript?	

b) The base composition of a virus was found to be 11% A, 32% G, 18% U and 39% C.

i. Is this a DNA or RNA virus? Explain your answer.. **[1 mark]**

ii. Is it single-stranded or double-stranded? Explain your answer. **[1 mark]**

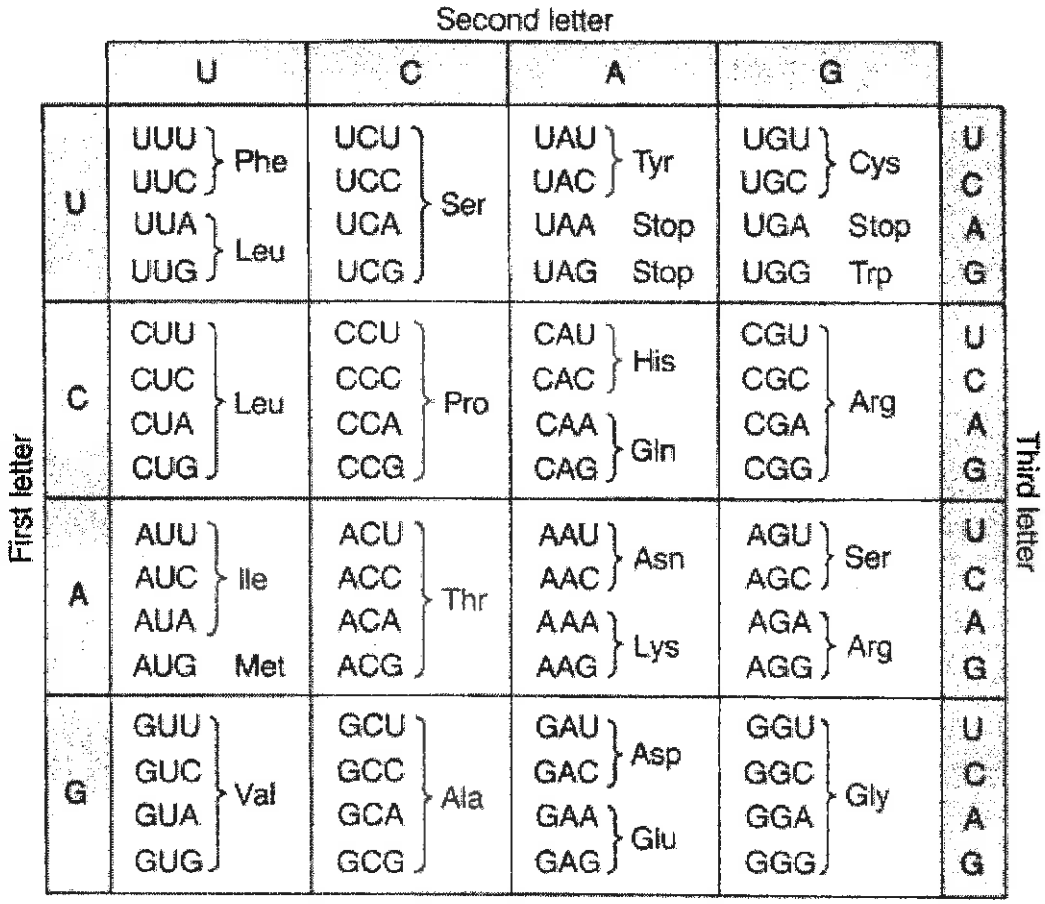
Continued...

c) Complete the following table using the genetic code provided.

[4 marks]

DNA template strand											
DNA coding strand										T	G	A
mRNA	G	C	A								
tRNA							G	C	A		
Amino acid				TRP							

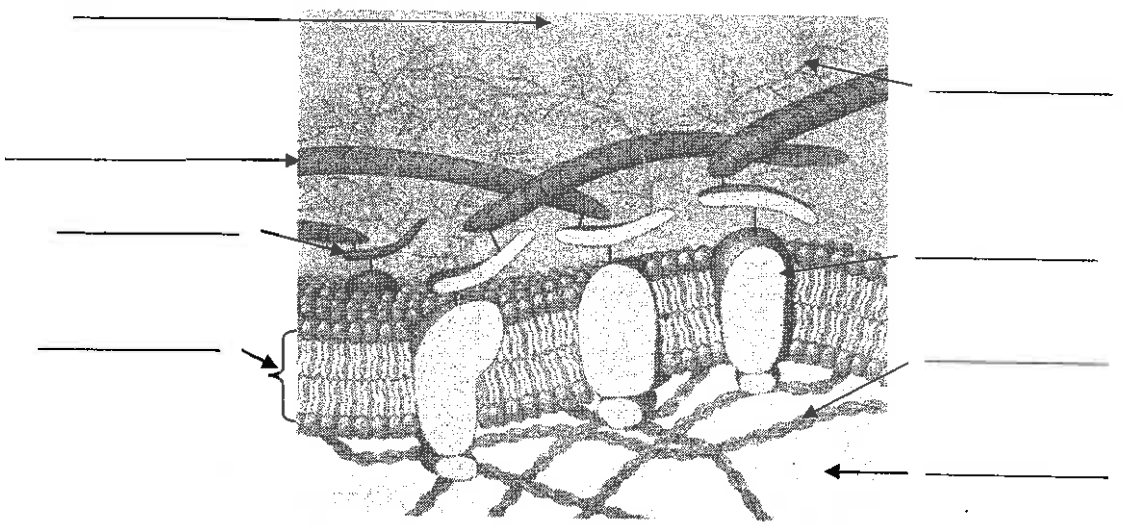
Codon chart



Continued...

Question 4

a) Identify the following structures. **[2 marks]**



b) For the following junctions state if the junction is Cell-cell or Cell- ECM junction and the type of the junction (Occluding, Communicating or Anchoring junction). **[6 marks]**

	Cell-cell or Cell-ECM junction	Type of junction
Hemidesmosome		
Tight junction		
Focal adhesion		
Desmosome		
Gap junction		
Adherens		

c) Briefly describe the function of a tight junction. **[2 marks]**

Continued...

Question 5

Imagine that you are a very pretty secretory protein such as Insulin. Describe your life from BIRTH to FREEDOM. **[10 marks]**

End of page